

REMARKS

Claims 1 - 20 remain active in this application. No amendments have been requested and no new matter has been introduced into the application.

Claims 1 - 4, 6 - 8 and 19 - 20 have been rejected under 35 U.S.C. §103 as being unpatentable over Aizaki in view of Utsumi, claims 5, 11 - 13, and 16 - 18 have been rejected under 35 U.S.C. §103 as being unpatentable over Aizaki in view of Utsumi and the Goodberlet publication, claims 9 - 10 have been rejected under 35 U.S.C. §103 as being unpatentable over Aizaki in view of Utsumi and Sakamoto et al., and claims 14 - 15 have been rejected under 35 U.S.C. §103 as being unpatentable over Aizaki in view of Utsumi, Goodberlet and Sakamoto et al. These grounds of rejection are respectfully traversed since the respective statements of these rejections do not address significant and explicit recitations of the claims and reflect a substantial lack of understanding of the invention while failing to make a *prima facie* demonstration of obviousness of any claim in the application. For the same reasons, it is also respectfully submitted that the finality of the present action is necessarily premature.

It is recognized that the invention may be somewhat difficult to visualize for any or all of a number of reasons. These reasons include the facts that the invention superimposes a relatively complex motion in a dither pattern of a two-dimensional pattern on a charged particle beam deflection system which is already complex and where reference locations for the beam are determined "downstream" from the position along the beam at which the invention is preferably applied due to shaping of the beam by truncation to form a stationary beam from a dithered beam while leaving the shadow pattern in motion according to a

dither pattern. Further, the two-dimensional pattern, any point of which may serve as a probe, is a shadow pattern; both of which (i.e. a "distributed" probe and the fact that the probe comprises a relative reduction in beam current) are opposite to the general practice in other types of position correcting arrangements in lithography systems and, hence, counter-intuitive. Additionally, it appears that some confusion may have derived from the term "dithering" which, in accordance with the invention, is produced by deflection but is of small magnitude in a rapid repetitive pattern (as implied by the term, itself, and as defined on page 13, lines 10 - 13 of the specification) and substantially negligible relative to other deflections available in the system and which may be imposed on the charged particle beam. As used in the art, the term "dithering" is clearly not a synonym for "deflection", as the Examiner appears to assert, but is well-understood to be a special case and specific type of deflection and distinct from other deflections provided by the system or tool. It should be noted in this regard, that dithering and deflection are separately recited in claims 16 and 20 as well as in dependent claims 2 and 3 and thus are clearly distinct from each other for that reason while the Examiner explicitly asserts "deflection relative to a mask" is known as "dithering"; thus incorrectly equating the terms and reading both on the same structures in the references.

The Examiner's confusion in regard to basic and distinguishing features of the invention is also evident from the fact that none of the four stated grounds of rejection addresses the claim recitations (emphasis added) of a shadow pattern being dithered "relative to and within a charged particle beam" (claim 1), "means for causing a shadow pattern *within* said charged particle beam, means for dithering said shadow pattern" (claim 16) or "causing a *moving* shadow pattern

within a shaped or patterned charged particle beam" (claim 20). That is, while the prior art applied may shape and/or pattern the beam by deflection operations relative to a mask and then further deflect the beam to a desired location on a target, none teaches or suggests providing a *moving pattern within* a charged particle beam; a feature which fully supports the meritorious function of the invention in achieving spatial phase locking for beam positional correction in an apparatus having a broad charged particle beam which may otherwise be shaped and/or patterned.

To convey an understanding of the importance of this feature to the meritorious function of the invention, The Examiner's attention is respectfully called, in particular, to pages 12 and 13 of the specification and Figures 2, 3 and 4. In a preferred form of the invention, a shadow pattern is initially imposed on an otherwise substantially uniform and *unshaped* beam by, for example, a grid 110. Dithering is then imposed by rapid deflection over small excursions in a repeated pattern by deflecting the *unshaped* beam including the shadow pattern by a dither deflection arrangement 120. The beam is then shaped by shaping apertures 20 and 50 and it is important to realize that, prior to further deflection of the *shaped* beam as may be desired for patterned by projection through a mask and/or deflection to a desired location on a target, the beam is stationary with the shadow pattern moving within it. That is, the shaping apertures truncate the edges of the *unshaped* beam and remove the dither deflection from the *shaped* beam while allowing the shadow pattern to continue moving within the *stationary, shaped* charged particle beam which may be later patterned and/or deflected as desired but which patterning and/or deflection is completely distinct from the dithering of the shadow pattern and of no importance to the basic principles of the

invention. It should also be appreciated in this latter regard that the patterning of the beam with a mask produces a pattern which is *stationary* relative to the beam in the same way shaping aperture(s) produce a stationary beam but which may be deflected (subject to positional errors corrected by the invention) to a desired location on a target.

The state of the beam immediately following the shaping aperture(s) is shown in Figure 3 and it is to be understood that the shadow pattern (e.g. of Figure 4) is moving in accordance with dither pattern (e.g. AA) within the *stationary, shaped* beam indicated by outline A in Figure 3. Any error in the location of the beam, such as is depicted by outline B, is also reflected in the position of the dither pattern of motion of the shadow pattern, as depicted by dither pattern BB of Figure 3 which is moving "relative to and within" the *shaped* beam. Therefore, the error in position of the *shaped* beam (which positional error will continue through other patterning and/or deflection operations which may be performed) will be accurately reflected in the timing of a point of the shadow pattern (e.g. Figure 4) falling on a fiducial mark 300; allowing correction of the positional error of the beam through spatial phase locking techniques which are known for narrow beams but have not been applicable to broad beams prior to the present invention.

Accordingly, it is seen that a distinguishing feature of the invention recited in the claims and entirely sufficient to support the meritorious function of allowing spatial phase locking to be applied to a broad charged particle beam is a shadow pattern moving or dithered relative to and within the beam. The four statements of the grounds of rejection asserted by the Examiner are completely silent as to the explicit recitation of this feature in the claims as quoted

above. Rather, the statements of the rejections refer to deflection of a beam relative to a mask for patterning and to deflection to a desired location on a target while incorrectly referring to such deflection as "dithering". Similarly, and regardless of the construction placed on the term "dithering" by the Examiner, the Examiner makes no effort to show how the prior art answers the recitations of the claims when "deflection" and "dithering" are separately recited in claims such as 2, 3, 16 and 20. Since the Examiner has not addressed explicitly recited and distinguishing features of the invention of a shadow pattern moving or being dithered relative to and within the beam, no *prima facie* demonstration of obviousness of any claim in the application has been made and it is clear that the stated grounds of rejection are in error since it appears that no *prima facie* demonstration of obviousness can be made based on the prior art of record (discussed in detail in previous responses, hereby fully incorporated by reference) since none of the prior art of record teaches or suggests the provision of a shadow pattern moving or dithered relative to and within the charged particle beam, much less for the purposes of correcting beam positional errors by application of spatial phase locking to a broad charged particle beam. Simply put, as previously pointed out, the rejections stated are not supported by the prior art relied upon while recitations of significant features of the invention sufficient to support its meritorious functions have been effectively ignored, evidently through misunderstanding of the invention by the Examiner which, it is hoped, the above discussion of the invention will ameliorate. Therefore, reconsideration and withdrawal of the grounds of rejection of record is respectfully requested.

By the same token, as alluded to above, it is

respectfully submitted that the finality of the present action is premature and should be withdrawn, as well. Logically, it is improper for an official action to be made final when no *prima facie* demonstration of the propriety of the grounds of rejection asserted therein (or, for that matter, in the preceding action) has been made, particularly where a lack of understanding of the distinguishing features of the invention and the manner in which they are recited in the claims is evident from the Examiner's statements of the grounds of rejection. Therefore, it is respectfully requested that the finality of the present official action be withdrawn so that this response will toll the Shortened Statutory Period for response. A sincere effort has been made to provide an increased understanding of the invention by the above discussion thereof. Should the Examiner seek to adhere to the stated grounds of rejection, it is respectfully requested that the Examiner contact the undersigned by telephone at the number given below so that the Examiner's understanding of the invention may be increased and any remaining issues expeditiously resolved.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Deposit Account No.

09-0458 of International Business Machines Corporation
(E. Fishkill).

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Marshall M. Curtis". The signature is fluid and cursive, with a long horizontal stroke at the end.

Marshall M. Curtis
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